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RESEARCH ARTICLE

A remarkable new species of *Cavichiana* (Hemiptera: Cicadellidae: Cicadellinae) from southeastern Brazil

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http://zoobank.org/B0F5B707-F5BD-46A6-9452-D4C04C880D8D

ABSTRACT. *Cavichiana* Mejdalani et al., 2014 was a formerly monotypic Cicadellinae genus exclusively found in bromeliads from southeastern Brazil. Here a new species is described, diagnosed, and illustrated from Itatiaia National Park, municipality of Itamonte, state of Minas Gerais (Mantiqueira mountain range); specimens were collected on *Vriesea* spp. (Bromeliaceae). *Cavichiana alpina* sp. nov. (male holotype in DZRJ) can be recognized by the following combination of features: (1) forewing clavus with basal portion and area along commissural margin orange, remainder of claval area blue (except dark brown apex); (2) corium with large blue area adjacent to claval sulcus, connected to blue area of clavus; (3) distal portion of female and male pygofer not sclerotized; (4) aedeagus with distinct basidorsal lobe and with apex narrowly rounded, not bearing crown of spines; and (5) female sternite VII with deep V-shaped posterior emargination. Notes on the distribution of the genus are provided and *C. bromelicola* Mejdalani et al., 2014 is newly recorded from southern Brazil.

KEY WORDS. Bromeliaceae, Cicadellini, leafhopper, morphology, Neotropical Region, taxonomy

INTRODUCTION

The sharpshooter genus *Cavichiana* Mejdalani et al., 2014 previously comprised a single species, *C. bromelicola* Mejdalani et al., 2014, exclusively found in bromeliads from the states of São Paulo and Rio de Janeiro, southeastern Brazil (Mejdalani et al. 2014). *Cavichiana bromelicola* has the body dorsoventrally flattened, a characteristic possibly associated with conditions of the mesohabitat inside the rosettes of Bromeliaceae (Mejdalani et al. 2014).

According to Mejdalani et al. (2014), *Cavichiana* is similar to *Aurigoniella* Takiya et al., 2001, *Juliaca* Melichar, 1926, *Microgoniella* Melichar, 1926, and *Platygonia* Melichar, 1925. However, *Cavichiana* can be distinguished from them, as well as from other New World Cicadellini genera, by the following combination of characters: (1) head deltoid, strongly produced anteriorly; (2) ocelli located distinctly anterad of anterior eye angles; (3) aedeagus tubular and elongate; and (4) paraphyses with both stalk and rami elongate; rami slender, each with a basidorsal dentiform projection. Mejdalani et al. (2014) also cited the presence of a crown of spines at the aedeagal apex as a diagnostic feature of *Cavichiana*, but this crown is lacking in the new species here described.

In the present paper, a new bromelicolous species of *Cavichiana* is described and illustrated based on material from Itatiaia National Park, municipality of Itamonte, state of Minas Gerais, southeastern Brazil. In addition, notes on the distribution of the genus are provided.

MATERIAL AND METHODS

Techniques for preparation of male and female terminalia structures followed Oman (1949) and Mejdalani (1998), respectively. Dissected terminalia parts were stored in small vials with glycerin and pinned below the specimens, as suggested by Young and Beirne (1958). Photographs of the habitus in dorsal and lateral views and of the male and female terminalia in ventral view were taken with a Leica M205 C stereomicroscope and processed with LAS 4.8 software; photographs of the ovipositor valvulae were taken with a Leica DMC2900 light microscope and processed with LAS 4.6 software. Structural terminology followed mainly Young (1968, 1977), except for the facial areas of the

head (Hamilton 1981, Mejdalani 1993, 1998) and the female terminalia (Nielson 1965, Hill 1970). Use of the term gonoplac followed Mejdalani (1998). Examined specimens belong to the following Brazilian institutions: Coleção Entomológica Prof. José Alfredo P. Dutra, Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro (DZRJ, Rio de Janeiro); Coleção Entomológica Padre Jesus Santiago Moure, Departamento de Zoologia, Setor de Ciências Biológicas, Universidade Federal do Paraná (DZUP, Curitiba); and Departamento de Entomologia, Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ, Rio de Janeiro). Label data were quoted exactly with a reversed virgule (\) separating lines on the labels. Using the online tool SimpleMappr (Shorthouse 2010), we prepared a map to show the known distribution of *Cavichiana* in Brazil.

TAXONOMY

Cavichiana alpina sp. nov.

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Figs 1–23, 25

Length (mm). Male holotype 7.5, male paratypes 7.7 (n = 2), female paratypes 7.9–8.2 (n = 3).

Description of the male holotype. Head (Figs 1, 23, 25). Deltoid in dorsal view, strongly produced anteriorly; median length of crown approximately 4/5 of interocular width and 1/2 of transocular width; anterior margin narrowly rounded in dorsal view; without distinct carina at transition from crown to face; ocelli located distinctly anterad of imaginary line between anterior eye angles, each slightly closer to median line than to adjacent anterior eye angle; crown, in lateral view, distinctly declivous anteriorly; surface without conspicuous sculpturing or setae. Antennal ledge, in dorsal view, not protuberant; in lateral view, with anterior margin convex. Frontogenal suture extending onto crown and reaching ocellus. Frons flattened medially; muscle impressions distinct; surface with small lenticular impressions. Epistomal suture obsolete medially. Clypeus broad and flat; apex broadly convex; profile, in lateral view, continuing contour of frons.

Thorax. Pronotum (Figs 1, 23, 25) with width slightly smaller than transocular width of head; lateral pronotal margins approximately parallel; posterior margin with slight emargination; dorsolateral carina complete, rectilinear; disk transversely striate, without punctures. Mesonotum with scutellum not striate. Forewing without distinct membrane; veins not very distinct except apically; with four apical cells, base of fourth more proximal than base of third; with three anteapical cells, bases of median and inner ones obscure; without anteapical plexus of veins. Hind wing with vein R_{2+3} incomplete. Posterior meron not exposed when forewing is at rest position. Hind leg with femoral setal formula 2:1:1 on right side and 2:1:1:1 on left side.

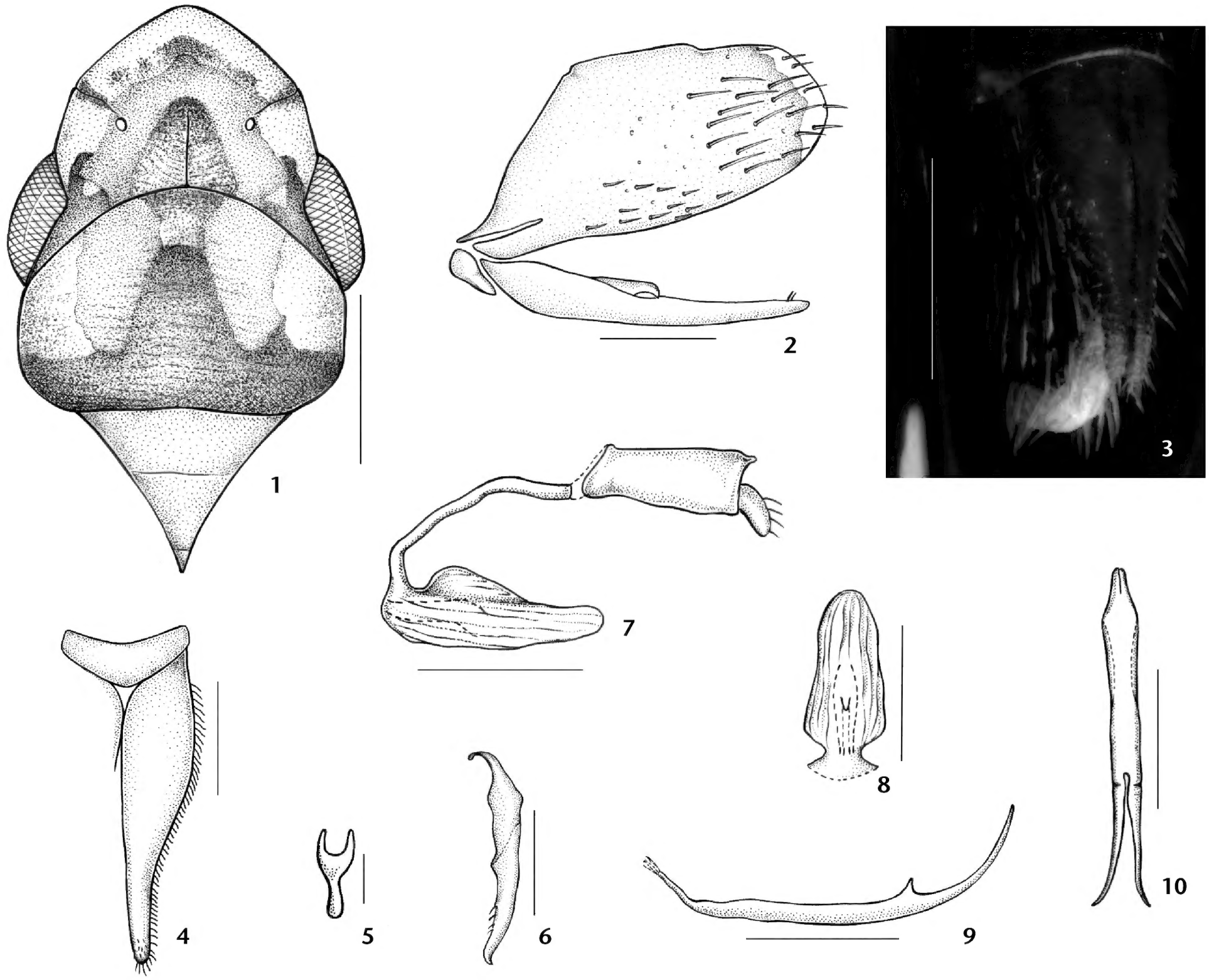
Terminalia. Pygofer (Figs 2–3), in lateral view, well produced posteriorly; distal margin broadly rounded; distal portion not sclerotized; ventral margin with slight concavity; without processes; surface with macrosetae distributed mostly on posterior third and extending anteriorly along ventral margin. Valve (Figs 2, 4), in ventral view, subtrapezoidal. Subgenital plate (Figs 2–4), in ventral view, broad on basal third and distinctly narrowed on median third; plates connected to each other basally by small membranous triangular area; in lateral view, extending as far posteriorly as pygofer apex; surface with slender setae located mostly on outer lateral margin and apical portion. Connective (Fig. 5), in dorsal view, small, Y-shaped; arms and stalk very short. Style (Fig. 6), in dorsal view, very elongate, extending much farther posteriorly than apex of connective; without preapical lobe; apical portion digitiform, slightly directed inwards. Aedeagus (Figs 7–8) symmetrical; shaft, in lateral view, with distinct basidorsal lobe; apex narrowly rounded, without crown of spines; in ventral view, shaft broad. Paraphyses (Figs 9–10) symmetrical, articulated with apex of connective; stalk long and broad; rami elongate, distinctly curved dorsally, divergent apically, each one with spiniform process at base.

Coloration (Figs 23, 25). Ground color of crown and anterior portion of pronotum light blue; crown with broad, inverted V-shaped orange mark extending from area of frontogenal sutures to posterior margin, connected to pair of large orange spots of pronotum; anterior margin of crown yellow; pronotum with posterior portion blue, this blue area with three projections directed anteriorly, median one (between orange spots) longer than lateral ones. Eye red. Mesonotum orange. Forewing dark brown; clavus with basal portion and area along commissural margin orange (this area narrowed basally and apically), remainder of clavus (except dark brown apex) blue; corium with large blue area adjacent to claval sulcus, connected to blue area of clavus; distal portion of corium with white to blue spot extending from costal margin to outer margin of median anteapical cell. Face mostly dark brown to black except yellow transition to crown. Labrum and labium yellow. Lateral and ventral portions of thorax brown to black. Legs mostly yellow; coxae mainly brown.

Note on the male paratypes. The external morphology and coloration of the two male paratypes are similar to those of the holotype.

Description of the female paratypes. External morphology and coloration similar to those of male holotype.

Terminalia. Sternite VII (Figs 11–12), in ventral view, with deep V-shaped posterior emargination. Pygofer (Figs 11, 13), in lateral view, well produced posteriorly; distal margin subacute; distal portion not sclerotized; ventral margin slightly rounded; macrosetae distributed mostly on posterior portion, extending for short distance dorsoanteriorly and to basal portion ventrally. First valvifer (Figs 13–14), in lateral view, subtrapezoidal, with posterior projection connected to gonangulum. First valvula (Figs 15–17), in lateral view, with apical portion spiniform; apex acute; dorsal sculptured area extending from basal portion of blade to apex, formed apically by scale-like processes arranged in



Figures 1–10. *Cavichiana alpina* sp. nov., male: (1) head, pronotum, and mesonotum, dorsal view; (2) genital capsule, lateral view (most setae of subgenital plate not shown); (3) genital capsule, ventrolateral view; (4) valve and subgenital plate, ventral view; (5) connective, dorsal view; (6) style, dorsal view; (7) aedeagus and anal tube, lateral view; (8) aedeagus, ventral view; (9) paraphyses, lateral view; (10) paraphyses, dorsal view. Scale bars: 1, 3, 10 = 1.0 mm, 2, 4, 6–9 = 0.5 mm, 5 = 0.1 mm.

oblique lines and basally by more linear processes; ventral sculptured area restricted to apical portion of blade, formed mostly by scale-like processes; ventral interlocking device distinct on basiventral half of blade. Second valvula (Figs 18–22), in lateral view, not strongly expanded beyond basal curvature; dorsal and ventral margins approximately parallel for most of their length; preapical prominence small but distinct; apex subacute; dorsal margin with about 20 continuous low teeth; denticles distributed on teeth and on dorsal and ventral portions of blade; dorsal denticulate apical portion longer than ventral portion; blade with ducts extending to teeth and to apex. Gonoplac (partially visible in Fig. 13) of the usual Cicadellinae type; in lateral view, with basal half narrow and apical half distinctly expanded; apex obtuse; surface with tiny tegumentary processes (denticuli) on apex and extending anteriorly along ventral margin.

Etymology. The new species name, *alpina* (L., feminine adjective), refers to the mountainous type-locality (Itatiaia National Park in southeastern Brazil) and its occurrence above 1,800 m a.s.l.

Type material. Southeastern Brazil, state of Minas Gerais (MG). Male holotype: "BR/MG – Itamonte\Trilha pela Serra Negra\22°19'27"S 44°40'00"W\16/XI/2013 2014 m\Daniela M. Takiya col." (DZRJ). Paratypes, two males and five females: one male with the same data as the holotype (DZUP), one male and two females "BR/MG – Itamonte,\PNI [Parque Nacional do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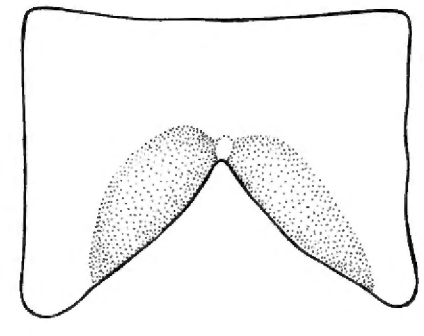
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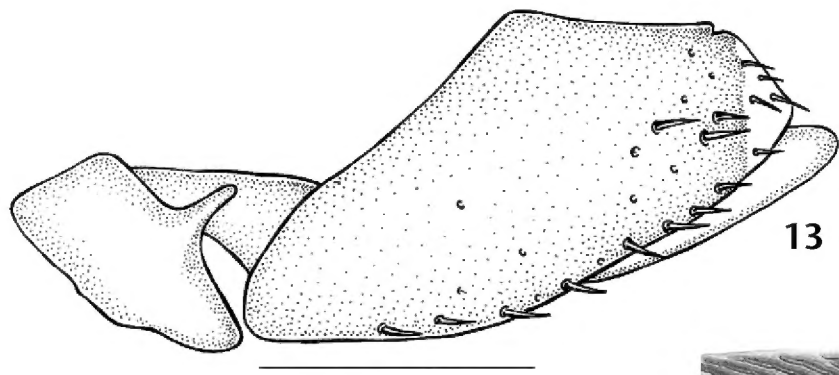
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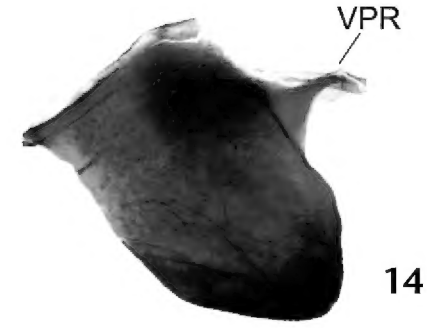

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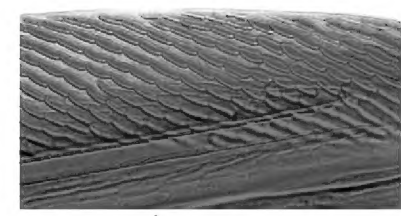

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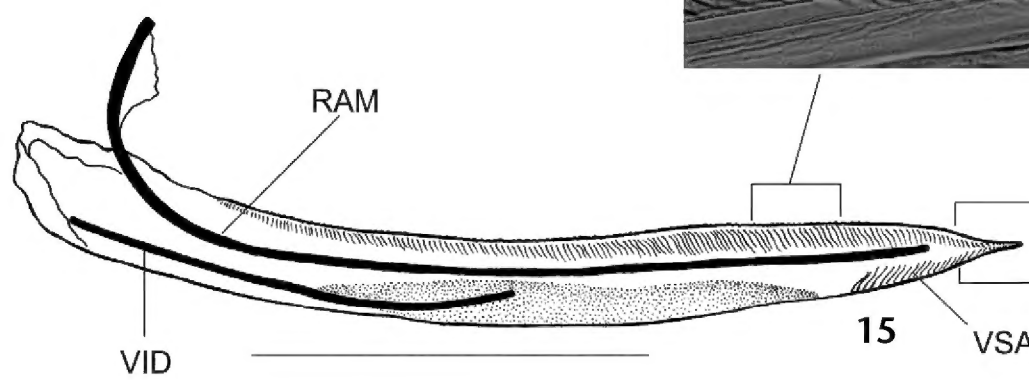

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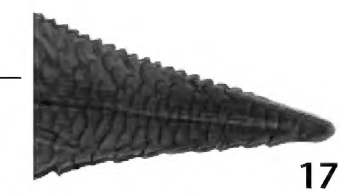
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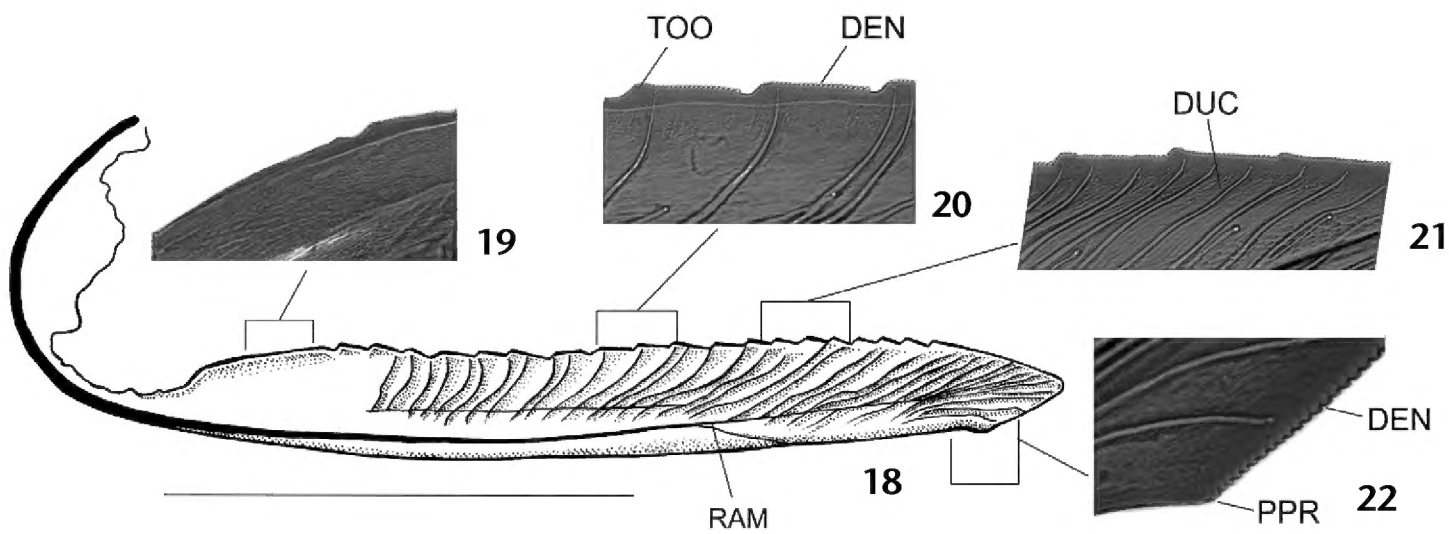

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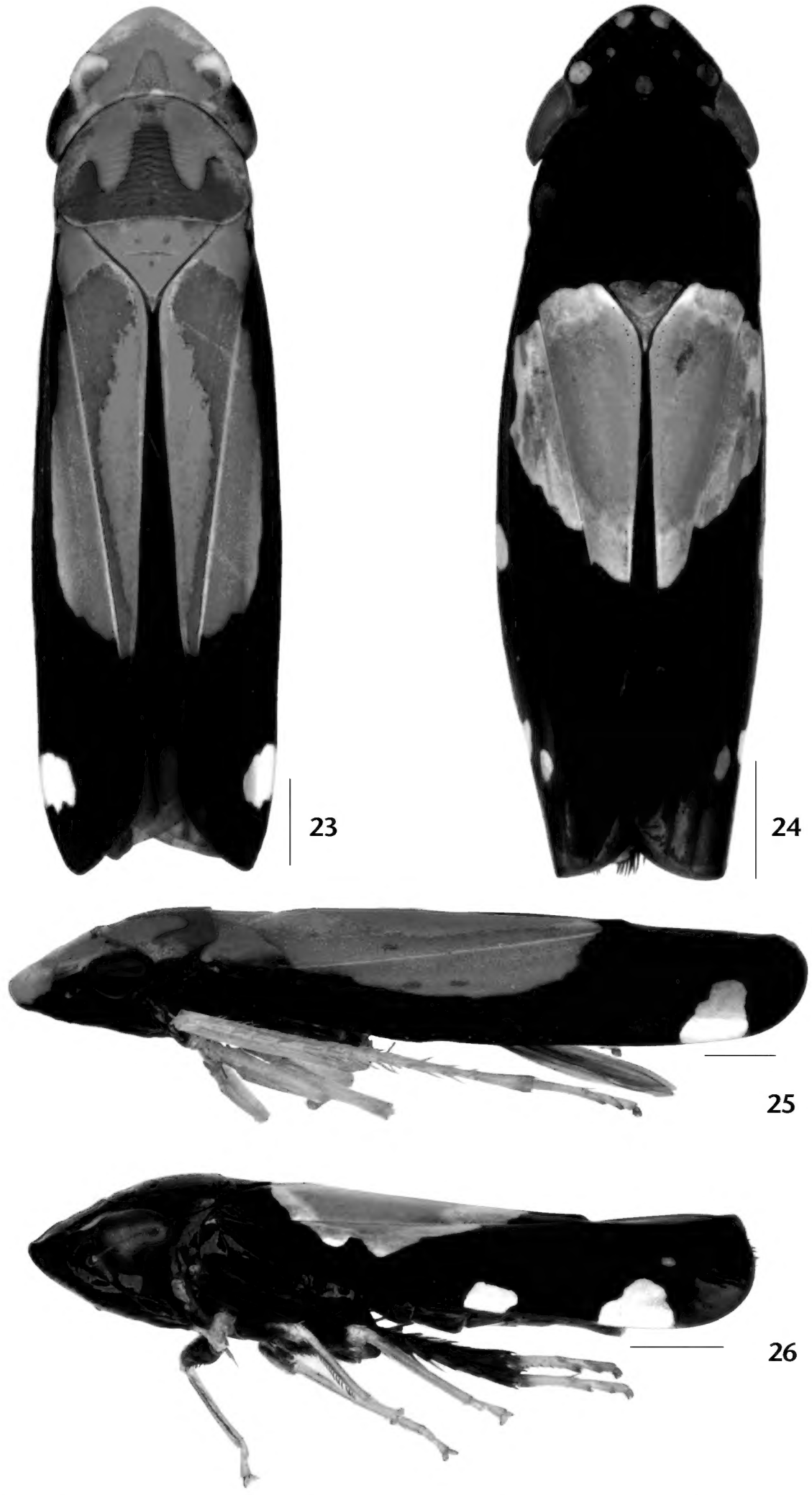
Figures 11–22. *Cavichiana alpina* sp. nov., female: (11) genital capsule, ventral view; (12) sternite VII, ventral view; (13) genital capsule, lateral view; (14) first valvifer, lateral view. (15–17) first ovipositor valvula: (15) blade, lateral view; (16) dorsal sculptured area; (17) apex. (18–22) second ovipositor valvula: (18) blade, lateral view; (19) teeth at basal portion; (20) teeth at median portion; (21) teeth at preapical portion; (22) preapical prominence. DEM: denticle; DSA: dorsal sculptured area; DUC: duct; PPR: preapical prominence; RAM: ramus; VID: ventral interlocking device; VPR: projection of valvifer; VSA: ventral sculptured area; TOO: tooth. Scale bars: 11, 13, 15, 18 = 1.0 mm, 12 = 0.5 mm.



Figures 23–26. *Cavichiana alpina* sp. nov. (23, 25) and *C. bromelicola* (24, 26), body in dorsal and lateral view, respectively. Scale bars = 1 mm.

Itatiaia], Casa de Pedra\22/IX/2018\André L. D. Ferreira col." (MNRJ, one female DZUP), two females "BRAZIL: Minas\Gerais, Itamonte\4. XI. 2007\N. Ferreira-Jr.*In Bromeliaceae*" (DZRJ), and one female "Brasil: MG, Itamonte, PNI,\Setor Brejo da Lapa, Brejo da\Lapa, PNI – M1A coord.\22°21'32.40"S,\44°44'14.04"W, 2142 m a.s.l." (MNRJ).

Additional specimens of the new species. Two males and one female were, unfortunately, lost due to the fire at

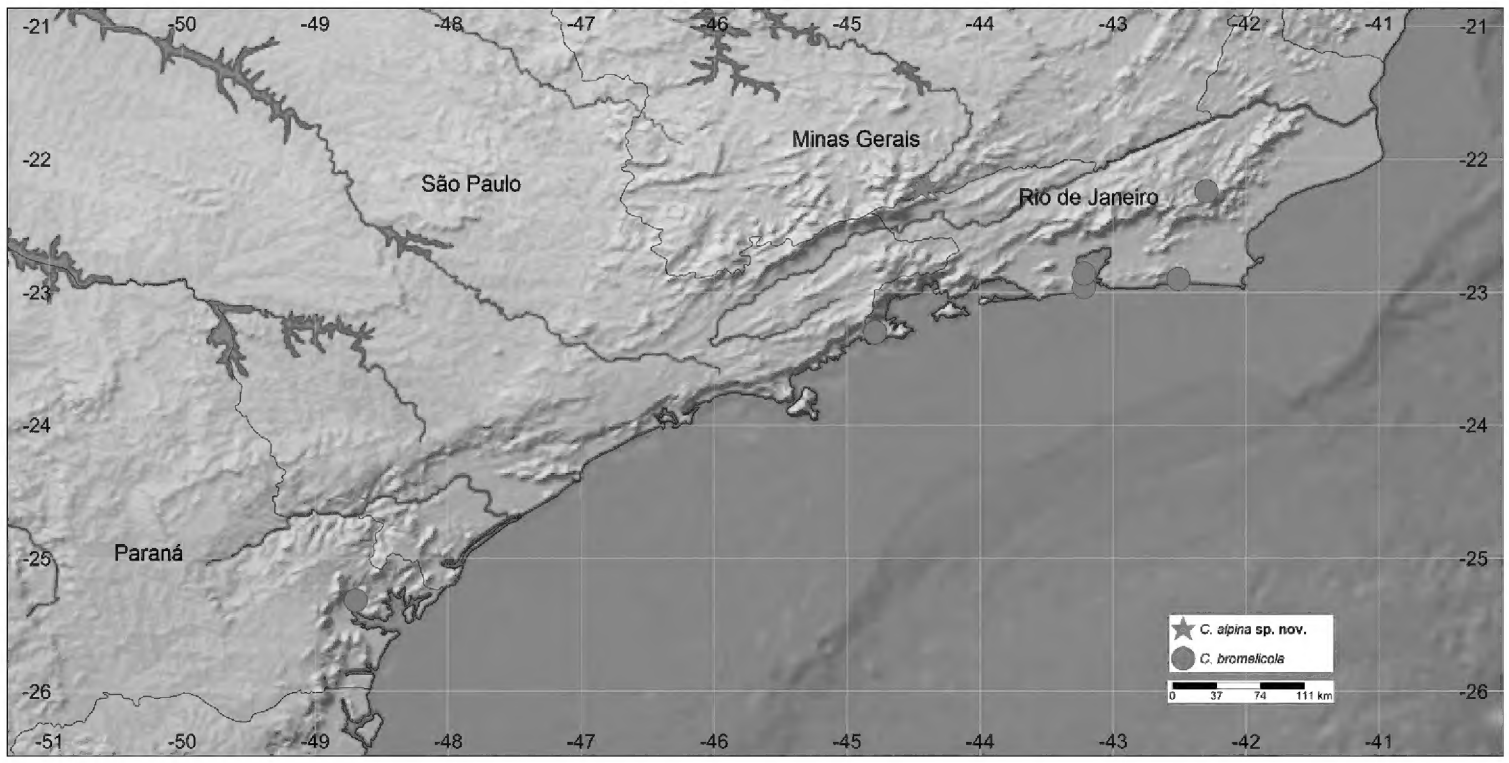


Figure 27. Known distribution of *Cavichiana* in southeastern and southern Brazil.

the Museu Nacional: "MG – ITAMONTE\PNI – CASA DE PEDRA\22-23/V/2018 2012 m\C.C.D. CORRÊA col." (MNRJ).

Examined material of *Cavichiana bromelicola* Mejdalani, Quintas, Carvalho & Takiya, 2014. Southeastern Brazil, state of Rio de Janeiro (RJ): one male "Nova Friburgo – Macaé\de Cima – RJ – Brasil\XI-XII/2009 1250 m\Grossi Leg." (DZUP). Southern Brazil, state of Paraná (PR): one male "Brasil, PR, Antonina\ Res. Rio Cachoeira, 50m\25.316°S 48.696°W\10-11.III.2017 Malaise\G. Melo leg." (DZUP).

DISCUSSION

The four diagnostic features of *Cavichiana* given in the introduction are clearly present in the new species; therefore, we are confident about the generic assignment. *Cavichiana alpina* sp. nov. is similar to the congeneric *C. bromelicola* (Figs 23-26), but the new species can be easily distinguished by its larger size (7.5–8.2 mm) and remarkable (i.e., conspicuous and contrasting) coloration of dorsum (crown, thorax, and forewing). Detailed diagnostic features of the new species are as follows: (1) forewing clavus (Figs 23, 25) with basal portion and area along commissural margin orange, remainder of claval area blue (except dark brown apex); (2) corium (Figs 23, 25) with large blue area adjacent to claval sulcus, connected to blue area of clavus; (3) distal portion of male (Figs 2, 3) and female (Figs 11, 13) pygofer not sclerotized, distinctly paler than more basal areas; (4) aedeagus (Fig. 7) with distinct basidorsal lobe and (5) with apex narrowly rounded, not bearing crown of spines; and (6) female sternite VII (Figs 11, 12) with deep V-shaped posterior emargination. Interestingly, we observed that the orange pronotal spots of *C. alpina* (Fig. 23) also occur in *C. bromelicola* nymphs, especially from the second to the fifth stadium (Quintas and Mejdalani, unpublished data). This observation is an additional support for the inclusion of the new species in *Cavichiana*.

Specimens of *C. alpina* sp. nov. have been collected in Itatiaia National Park, southeastern Brazil. The collection sites are located on a mountainous region (Mantiqueira mountain range; Fig. 27), all above 1,800 m a.s.l. *Cavichiana bromelicola* has been previously recorded only from sea level regions (including the Restinga de Maricá and Picinguaba in the states of Rio de Janeiro and São Paulo, respectively). However, this species is here newly recorded from a mountainous area (1,250 m a.s.l.) of southeastern Brazil (Nova Friburgo, state of Rio de Janeiro) and from a sea level locality in southern Brazil (Antonina, state of Paraná) (Fig. 27). A putative common exclusive ancestor of the two *Cavichiana* species was perhaps widely distributed in southeastern and southern Brazil. A vicariant event, such as the uplift of the southeastern Brazilian mountain ranges during the latest Eocene or Oligocene (Safford 1999), may have caused the diversification into these two species. This event was suggested to be associated with speciation in two other sharpshooter genera recorded from southeastern Brazil, viz., *Balacha* Melichar, 1926 (Takiya and Mejdalani 2004) and *Scoposcartula* Young, 1977 (Rodrigues et al. 2010).

Alike its congeneric species, *C. alpina* sp. nov. was also collected from inside bromeliads. The holotype and one male paratype were collected on a small epiphyte identified as *Vriesea* sp. (Fig. 28), whereas specimens collected at Casa de Pedra were from a large ground *V. sazimae* Leme (Fig. 29). *Vriesea* sp. is most likely *V.* cf. *friburgensis* Mez, based on the identification of a similar individual with inflorescence photographed at the same sampling site.

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Figures 28–29. Host bromeliads of *Cavichiana alpina* sp. nov. from Itatiaia National Park. (28) *Vriesea* cf. *friburgensis* (photo by D. Takiya); (29) *Vriesea sazimae* (photo by C. Dias).

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